Proposed Hamilton County MSD Rules Section 2407 – Storm Water Separation Policy

Exhibit A

Section 2407- Storm Water Separation Policy

Preamble

It is well documented that storm water contains pollutants which may cause or contribute to water quality impairment in our local streams and rivers. Storm water entering the combined sewer system and separate sanitary sewer system also leads to unwanted wet weather overflows. The regulation of storm water quantity and quality is increasing. MSD plans to implement strategic sewer separation projects where a combined sewer will be separated into a separate storm water sewer and a separate sanitary sewer. These separation projects will result in new storm water discharges that will need to be addressed in terms of quantity and quality. The Board of County Commissioners (BOCCs) directed the County Administration to adopt an appropriate policy, in the form of an MSD rule and regulation, that will govern the implementation of sewer separation projects to (a) ensure that all appropriate measures are being taken to comply now and in the future with applicable water pollution laws, regulations, and policies, (b) consider long-term costs, risks, and benefits from storm water separation projects, and (c) establish requirements for the use and non-use of storm water separation in the implementation of current and future CIP programs, asset management programs, the WWIP, and any adaptive management project proposals that may result in changes to the WWIP.

Storm Water Separation Policy

This Storm Water Separation Policy ("Policy" or "Storm Water Separation Policy") governs projects where storm water separation ("Separation") occurs by MSD. Separation projects are defined as projects that plan, design or construct (i) green infrastructure, (ii) separate storm sewers, or (iii) the repurposing of existing sanitary sewers or combined sewers to separate storm sewers, any of which result in:

(a) a new storm water outfall from an MS4[1] in Hamilton County to waters of the state, or

(b) additional storm water discharges to an existing MS4, or

(c) storm water discharges routed back to the combined sewer system after separation.

The overarching purpose of the Storm Water Separation Policy is to maximize improvement to in-stream water quality and ultimately achieve attainment of water quality standards at the lowest reasonable cost as outlined in the Affordable Water Quality Decision Flow Chart in Attachment B. The Storm Water Separation Policy is designed to achieve the lowest cost storm water pollutant reduction for the investment.

[1] MS4 (Municipal Separate Storm Sewer System) is defined by Ohio EPA in the MS4 NPDES permit issued to Hamilton County and members of the Hamilton County Storm Water District.

This Policy applies to all MSD Separation projects as defined above, whether such projects are listed in the Final WWIP or Consent Decrees, or is an Allowance project or Asset Management project.

This Policy does not apply to those projects (i) listed in the Revised Original LMCPR as submitted to the Consent Decree Regulators in December 2012 and approved by those Regulators, and (ii) specifically exempted on a case by case basis as determined and approved by the BOCCs.

TOPIC	POLICY AND PROCEDURES
Water Quality	This Policy requires MSD to: (a) gather sufficient water quality data for the receiving stream/creek in the area surrounding the proposed project or associated discharge; (b) thoroughly and accurately identify, evaluate, and document expected water quality impacts for each Separation project; (c) determine the lowest cost project to maximize improvement to in-stream water quality and achieve further reasonable progress towards attainment of water quality standards in the receiving stream; and (d) present to the BOCCs a report on this work for each Separation project subject to the Separation Policy. **Attachment A** sets forth a Sewer Separation Project Decision Flow Chart for Water Quality required to be used by MSD and County Administration in implementing this Policy. **Attachment B** sets forth an Affordable Water Quality Decision Flow Chart for Program/Watershed to achieve the lowest reasonable cost for pollution reduction required to be used by MSD and County Administration in implementing this Policy. **Attachment C** sets forth Technical Water Quality Criteria to Meet Current Standards required to be used by MSD and the County Administration, in all water quality evaluations of Separation projects and Program/Watershed-wide planning that may include Separation Projects, to meet current Legal Standards. **Attachment D** sets forth Technical Water Quality Criteria to Meet Future Legal Standards required to be used by MSD and the County Administration, in all water quality evaluations of Separation projects and Program/Watershed-wide planning that may include Separation Projects, to meet future legal standards.

TOPIC	POLICY AND PROCEDURES
	Attachment E is a summary of potentially applicable Legal Standards. **Attachment H** sets forth technical criteria for Separation projects that separate storm water from the combined sewer system and reconnects to the combined sewer system, required to be used by MSD and the County Administration in implementing this Policy. **Attachment I** outlines the primary steps and analyses required to be performed for each proposed storm water Separation project in implementing this Policy.
Water Quantity / Flooding	This Policy requires MSD to: (a) thoroughly and accurately identify, evaluate, and document water quantity impacts to the receiving stream/creek including those related to water volume and peak flow, for each Separation project, and (b) present to the BOCCs a report on this work for each Separation project as noted above. **Attachment F** sets forth a Sewer Separation Project Specific Water Quantity/Flooding Decision Flow Chart required to be used by MSD and County Administration in implementing this Policy. **Attachment G** sets forth Technical Water Quantity Evaluation Criteria required to be used by MSD and the County Administration in all water quantity/flooding evaluations of Separation projects and in Program/Watershed-wide planning that may include Separation Projects. **Attachment H** sets forth Technical Criteria for Projects that Separate Storm water from the combined sewer system and reconnects to the combined sewer system required to be used by MSD and the County Administration in implementing this Policy. **Attachment I** outlines the storm water Separation primary steps and analyses required to be performed for each proposed Separation project in implementing this Policy.
Costs: Short Term and Long Term	This Policy requires MSD to: (a) thoroughly and accurately identify, evaluate and document costs for each Separation project according to, at a minimum, all of the following criteria: • Estimated capital project costs, including planning, design, and

TOPIC	POLICY AND PROCEDURES
	construction based on a Class 3 Schematic/Deterministic 30% Design level cost estimate in accordance with MSDGC Estimating Guidelines, January 2009 or current County approved MSDGC Estimating Guidelines; • Long-term operation and maintenance and/or replacement over 25 and 40 year time spans (so-called "lifecycle costs"); • Costs needed to maintain compliance with all applicable laws and regulations, including the Clean Water Act and MS4 NPDES permits ("Legal Standards"), including: – Minimum costs estimated to meet current Legal Standards, which are set forth in **Attachment C**; – Best value scenario – Identify additional costs above the minimum cost estimate that could be added to the project that would not only meet current Legal Standards, but also would control, to a reasonable level, any other pollutants of concern listed in **Attachment D** without a significant increase in cost; – Maximum estimated costs required to meet potential future legal standards set forth in **Attachment D** in 25 years; (b) express costs in both 2006 U.S. Dollars and in net present value current year (e.g., 2014); (c) use nationally accepted cost evaluation methods for comparable projects such as the Association for the Advancement of Cost Engineering International; (d) clearly identify and break-out separately all contingency cost estimates for each stage of each project; (e) if the Separation project is, in whole or in part, to address CSO/SSO issues related to the Consent Decrees, compare the initial estimated capital costs, with the cost estimate for the relevant original project in the Final WWIP; and (f) present to the BOCCs a report on this work for each Separation project subject to the Separation Policy. **Attachment C** lists technical and water quality assumption criteria required to be used to estimate costs to meet current Legal Standards.

TOPIC	POLICY AND PROCEDURES
	Attachment D lists technical and water quality assumption criteria required to be used to estimate costs to meet future Legal Standards. **Attachment E** summarizes potentially applicable Legal Standards required to be used by MSD and the County Administration in their respective evaluations of Separation projects and in Program/Watershed-wide planning that may include Separation projects. **Attachment H** sets forth criteria for Separation Projects that reconnect to the combined sewer system required to be used by MSD and the County Administration in implementing this Policy.
Ownership of Old and New Pipes	This Policy requires MSD to: (a) thoroughly and accurately identify, evaluate and document the risks and future costs, including long-term life-cycle costs, of installing a new pipe system for both a "storm water only" (new storm water pipe) scenario and a "sanitary sewage only" (new sanitary sewage pipe) scenario for each Separation project and all related Allowance work, and (b) present to the BOCCs for approval the design/performance criteria (with technical and cost information) for the "new pipe systems" for the "storm water only" scenario and "sanitary sewage only" scenario. This Policy directs that there is no automatic presumption that (i) the "new pipe" will be for storm water or sanitary flows, or (ii) the storm water pipe will be owned, operated and/or maintained by MSD. MSD shall make recommendations to the BOCCs in this regard. Discussion and coordination with local jurisdictions may be needed to develop a recommendation, and MSD shall document all such discussion and coordination for review by the County Administration and BOCCs. This Policy also prohibits MSD from entering into any Memorandum of Understandings (MOUs) or other agreements with any cities or villages (including the City of Cincinnati Storm Water Management Utility (SMU)) regarding ownership, O&M, or design/performance criteria for Separation projects or related Allowance work without the prior approval of the BOCCs. This Policy clarifies that the BOCCs will make policy decisions regarding: (a) the use of Separation on any given project and its strategic use in any program or watershed; (b) whether the "new pipe" is for storm water only or for sanitary sewage

TOPIC	POLICY AND PROCEDURES
	only; (c) whether the County will or will not own and or maintain the "new pipe"; and (d) what future obligations, if any, MSD will bear for renovation, upgrade, replacement and O&M costs.
County Review Procedures	This Policy directs that County Administration (including the Administration staff, County MSD Monitor, and County legal) shall review MSD Separation projects at various stages in the development of the project, including during project concept development, project nomination, planning, and detailed design and engineering. The County Administration team is directed to review the projects for consistency with the Separation Policy and provide recommendations to the BOCCs.

Attachments

A Sewer Separation Project Decision Flow Chart for Water Quality

B Affordable Water Quality Decision Flow Chart for Program/Watershed

C Technical Water Quality Evaluation Criteria to Meet Current Legal Standards

D Technical and Water Quality Evaluation Criteria to Meet Future Legal Standards

E Potentially Applicable Legal Standards Summary

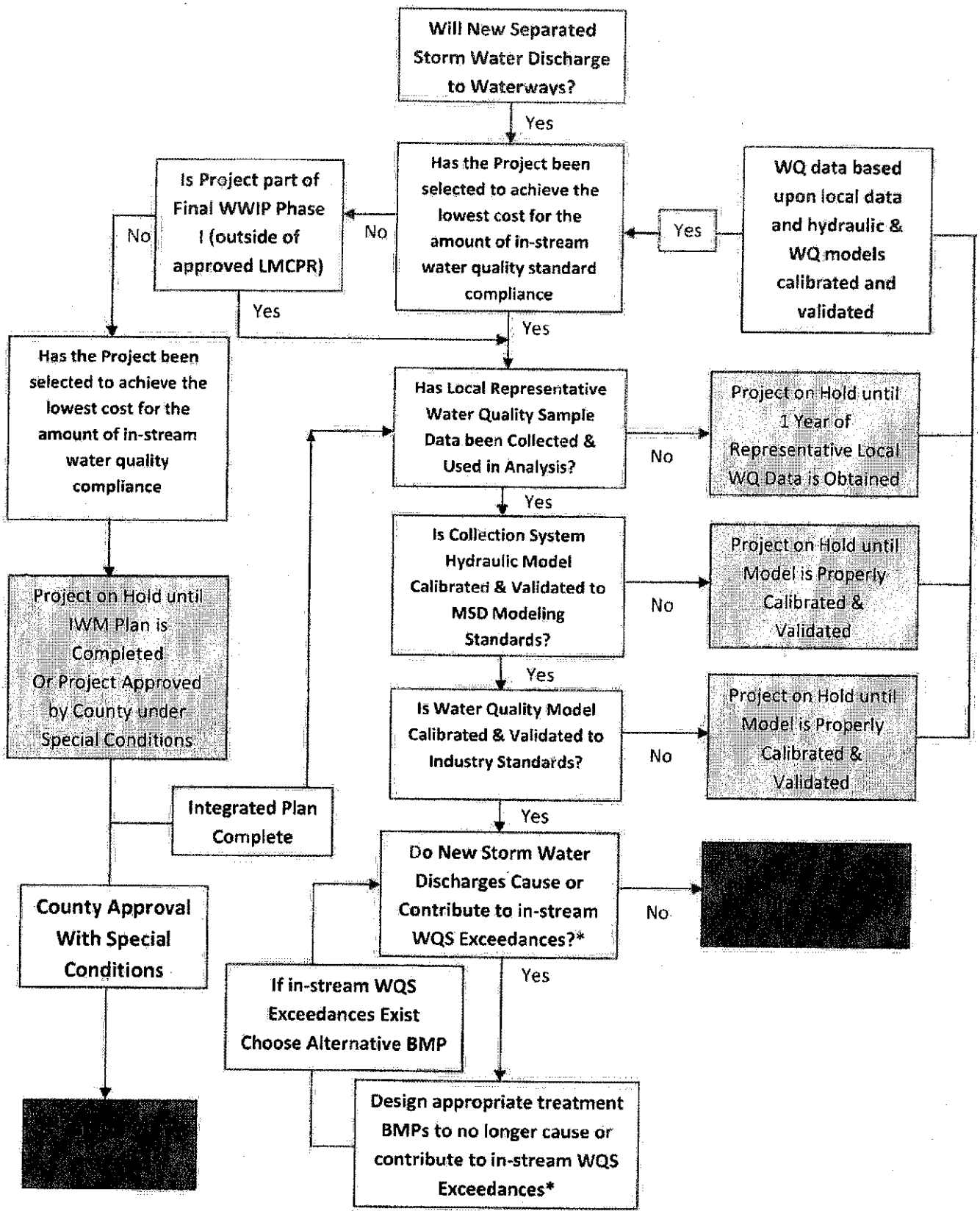
F Sewer Separation Project Water Quantity/Flooding Decision Flow Chart

G Technical Water Quantity Evaluation Criteria

H Technical Criteria for Projects that Separate Storm Water from the Combined Sewer System and Reconnects to the Combined Sewer System

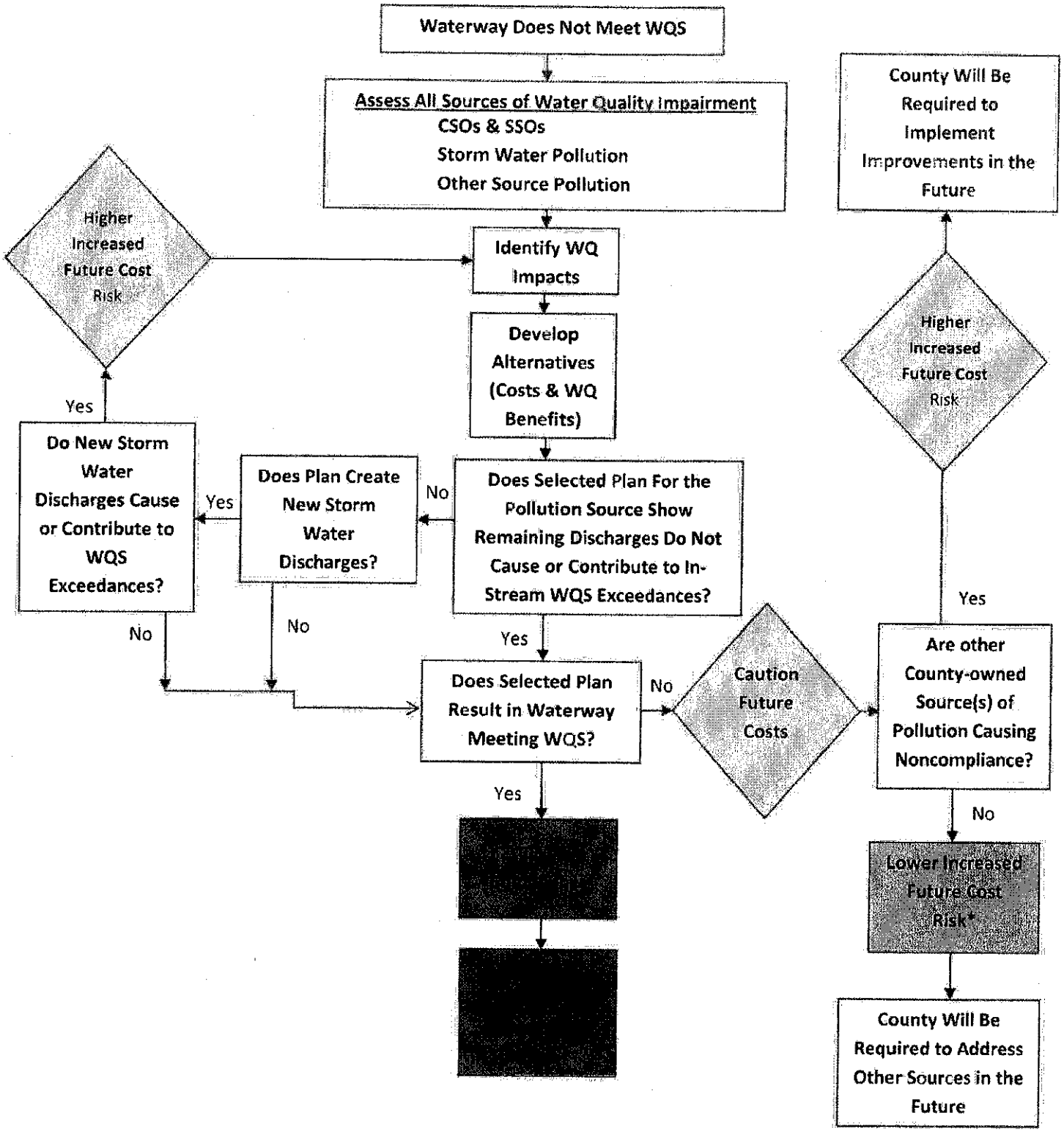
I Storm Water Separation Policy Guidance: Sample Scope of Work for Implementing the Storm Water Separation Policy

Attachment A - Sewer Separation Project Decision Flow Chart for Water Quality



*In-stream water quality analysis is required with and without background sources to show compliance.

Attachment B - Affordable Water Quality Decision Flow Chart for Program/Watershed



*Based on experience of other communities, there is a future risk that more pollution abatement from SSOs, CSOs, and/or storm water discharges could be required by EPA at more cost because receiving waterway does not meet WQSs.

Attachment C

Technical Water Quality Evaluation Criteria to Meet Current Legal Standards

1. Collect and/or use local representative sampling data for the storm sewer discharge, and in-stream dry weather and in-stream wet weather water quality sampling data upstream and downstream of the project area. Monitoring and Sampling Program shall be based on industry standards to be developed by MSD and approved by the County Administration.

2. Water Quality Models shall be based on standards to be developed by MSD that are consistent with Industry Standards and approved by the County Administration.

3. Demonstration that new storm water discharges do not cause or contribute to in-stream Water Quality Standard (WQS) exceedances:

   (a) The Pollutants of Concern for such demonstration shall be Bacteria (E. Coli), and nutrients (Nitrate + Nitrite and Total Phosphorus). For each water body, determine the applicable Ohio EPA in-stream WQS for these Pollutants of Concern. For the Mill Creek, utilize the nutrients values in the Ohio EPA TMDL dated September 2004 for in-stream Nitrate + Nitrite at 2.5 mg/l and in-stream Total Phosphorus at 0.25 mg/l. The in-stream WQS or in-stream target concentrations shall be determined or developed by MSD for each water body and approved by the County. In the absence of an applicable in-stream WQS or in-stream target pollutant concentration for these Pollutants of Concern for a water body, contact Ohio EPA for guidance. The development of in-stream target concentrations is for internal use by MSD and the County in performing water quality analyses and appropriate planning, and is not intended to encroach or supplant the authority of any other regulatory agency.

   (b) Select and size appropriate water quality and/or volume-based best management practices (BMPs) to remove the Pollutants of Concern (above) to meet applicable Legal Standards (as defined in this attachment) and demonstrate that the storm water discharges will not cause or contribute to in-stream WQS or in-stream target concentration exceedances at or downstream of the discharge. BMP pollutant removal performance shall be based on pilot demonstrations from local or locally applicable BMP installations of representative size and capacity.

   (c) Run calibrated and validated water quality model with and without existing pollutants from existing sources already in the stream/creek (background sources) for the typical year or longer typical period to demonstrate that the separated storm water after treatment by the selected BMPs will not cause or contribute to in-stream WQS or in-stream target concentration exceedances at or downstream of the discharge for each Pollutant of Concern above.

4. If the Separation project storm water discharge is determined to cause or contribute to in-stream WQS or in-stream target concentrations exceedances based on step 3(c) above, then additional BMPs shall be selected and step 3(c) repeated (or the project modified,

changed or eliminated) until the storm water discharge is determined to not cause or contribute to in-stream WQS or in-stream target concentration exceedances at or downstream of the discharge for each Pollutant of Concern above.

Attachment D

Technical and Water Quality Evaluation Criteria to Meet Future Legal Standards

1. Collect and/or use local representative sampling data for the storm sewer discharge and in-stream dry weather and in-stream wet weather water quality sampling data upstream and downstream of the project area. Monitoring and Sampling Program shall be based on Industry Standards to be developed by MSD and approved by the County Administration.

2. Water Quality Models shall be based on standards to be developed by MSD that are consistent with Industry Standards and approved by the County Administration.

3. Demonstrate that new storm water discharges do not cause or contribute to in-stream Water Quality Standard (WQS) exceedances:

   (a) In addition to those Pollutants of Concern identified in Attachment C evaluate:

   Total Suspended Solids
   Organic enrichment
   Metals
   Toxics
   Temperature
   Dissolved Oxygen

   For the applicable water body, refer to Ohio EPA WQSs, Ohio EPA TMDLs, Watershed Action Plans, biological and water quality studies and other EPA standards, for information on each Pollutant of Concern listed above.

   (b) Using knowledge about the water body, and it's in-stream WQS attainment status and sources of impairment, determine which Pollutants of Concern listed in 3(a) above should be specifically considered for treatment or control to a reasonable level because of potential future Legal Standards or would achieve further reasonable progress towards attainment of in-stream water quality standards, without a significant increase in cost. Determine the applicable in-stream WQS or appropriate in-stream target pollutant concentration for those Pollutants of Concern selected that will be protective of in-stream water quality for the applicable water body. The applicable in-stream WQS or in-stream target pollutant concentration shall be determined or developed by MSD for each water body and approved by the County Administration. In the absence of such an applicable in-stream WQS or in-stream target pollutant concentration for a water body, contact Ohio EPA for guidance. The development of in-stream target concentrations is for internal use by MSD and the County in performing water quality analyses and appropriate planning, and is not intended to encroach or supplant the authority of any other regulatory agency.

   (c) Select and size appropriate water quality and/or volume-based best management practices (BMPs) to remove the Pollutants of Concern above to meet applicable

Legal Standards and demonstrate that the storm water discharges will not cause or contribute to in-stream WQS or in-stream target pollutant concentration exceedances at or downstream of the discharge. BMP pollutant removal performance shall be based on pilot demonstrations from local or locally applicable installations of representative size and capacity.

(d) Run calibrated and validated water quality model with and without existing pollutants from existing sources already in the stream/creek (background sources) for the typical year or longer typical period to demonstrate that the separated storm water after treatment by the selected BMPs will not cause or contribute to WQS or in-stream target pollutant concentration exceedances at or downstream of the discharge for each Pollutant of Concern selected above.

4. If the Separation project storm water discharge is determined to cause or contribute to in-stream WQS or in-stream target concentration exceedances based on step 3(d) above, then additional BMPs shall be selected and step 3(d) repeated (or the project modified, changed or eliminated) until the storm water discharge is determined to not cause or contribute to in-stream WQS or in-stream target concentration exceedances at or downstream of the discharge for each Pollutant of Concern above.

5. The costs for such BMPs or project modification resulting from step 4 above will be used in identifying additional costs above the minimum cost estimate that could be added to the project that would not only meet current Legal Standards, but also would control, to a reasonable level, the Pollutants of Concern selected in step 3b without a significant increase in cost, and the maximum estimated costs required to meet potential future legal standards as projected in 25 years.

Attachment E

Potentially Applicable Legal Standards Summary

1. Federal
   - 1.1 Statutes
     - 1.1.1 Clean Water Act
     - 1.1.2 Safe Drinking Water Act
     - 1.1.3 Rivers and Harbors Act
     - 1.1.4 Flood Disaster Protection Act
     - 1.1.5 Other
   - 1.2 Federal regulations
     - 1.2.1 Current
     - 1.2.2 Future (reasonably possible)
   - 1.3 USEPA policies and guidance
   - 1.4 FEMA flood-related policies and guidance
   - 1.5 USACOE cut/fill/wetlands related policies and guidance
   - 1.6 NEPA (National Environmental Policy Act)
   - 1.7 Cultural resources survey – archaeological and cultural resources review/permit (see also 2.5 below)
   - 1.8 US Fish & Wildlife review for endangered species

2. State of Ohio
   - 2.1 Ohio Revised Code
     - 2.1.1 OEPA regulation of surface water, underground injection, wetlands
     - 2.1.2 Ohio DNR regulation
     - 2.1.3 Ohio Historical Preservation Office regulation
   - 2.2 Ohio EPA regulations
     - 2.2.1 Current
     - 2.2.2 Future (reasonably possible)
   - 2.3 Ohio EPA Permits
     - 2.3.1 Permits to Install
     - 2.3.2 NPDES
     - 2.3.2.1 Existing for CSO's (modification)
     - 2.3.2.2 New for direct discharges (or MS4 Permit, see below)
     - 2.3.2.3 Construction run-off
     - 2.3.3 MS4 Permit (see also County Storm Water District, below)
     - 2.3.4 UIC Permits (potential)
     - 2.3.5 CWA 401/414 Permits (cut/fill/wetlands)
   - 2.4 Ohio DNR
     - 2.4.1 Permits: Dams, retention basins, etc.
   - 2.5 Ohio Historical Preservation Office review/permit

3. Consent Decree

- 3.1 Consent Decree (2004 as amended)
- 3.2 Wet Weather Implementation Plan
  - 3.2.1 Final WWIP (2009)
  - 3.2.2 Any approved changes post 2009

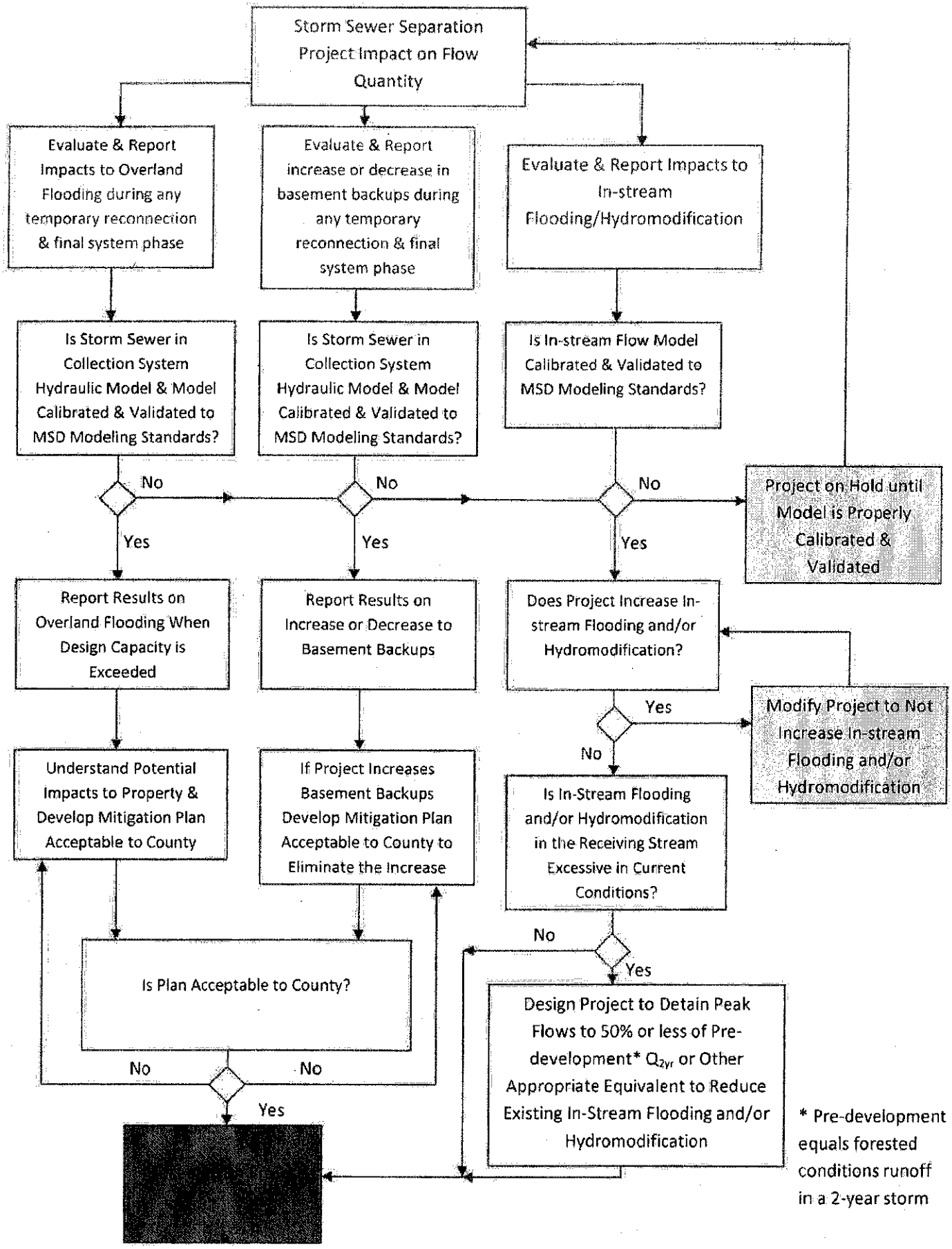
4. Local Water Quality Regulation

- 4.1 Hamilton County Storm Water District (HCSWD) Rules and Regulations and MS4 Permit terms and conditions
- 4.2 Municipal ordinances adopting the HCSWD rules
- 4.3 Other municipal ordinances/rules/policies regulating water quality

5. Local Water Quantity Regulation

- 5.1 MSD Rules and Regulations
- 5.2 Municipal or County ordinances/resolutions/rules/policies covering water quantity

Attachment F - Sewer Separation Project Water Quantity/Flooding Decision Flow Chart



Attachment G

Technical Water Quantity Evaluation Criteria

1. Thoroughly and accurately identify, evaluate and document the following with regard to the level of service (storm year/size capacity) (collectively, "Level of Service"):

   (a) The existing Level of Service in the specific areas to be impacted by the Separation project;

   (b) The Level of Service that would be required or used if the local jurisdiction constructed and paid 100% of the Separation project;

   (c) The Level of Service that would be used if the Separation project is designed according to the standards of the Hamilton County Engineer;

   (d) If the Separation project is within the City of Cincinnati, the Level of Service under the City's Storm Water Management Utility ("SMU") standards;

   (e) The MSD recommended Level of Service to be provided by the Separation project after construction with justification, including justification for any deviations from existing Level of Service; and

   (f) If the MSD recommended Level of Service is different from the local jurisdiction's or Hamilton County's required Level of Service based on their required rainfall distribution, then provide the cost differential between MSD's recommended Separation project costs and an alternative project using, (i) existing Level of Service, (ii) 10 year storm Level of Service, (iii) 25 year storm Level of Service, (iv) 50 year storm Level of Service, and (v) 100 year storm Level of Service.[1]

2. Present to the BOCCs a report on this work for each Separation project subject to the Separation Policy.

3. The quantity of expected flow of storm water from the Separation project shall be based upon accurately calibrated and validated collection system models using both the "Code of Practice for the Hydraulic Modeling of Sewer Systems" — Wastewater Planning Users Group (WaPUG) Version 3.01 (2002), and MSDGC Modeling Guidelines and Standards November 2011, or in the alternative, models proposed by MSD and approved by the County Administration.

[1] Based on the SCS Type II storm rainfall distribution.

4. Provide an evaluation of whether the Separation project will increase or decrease the likelihood of basement back-ups during any temporary reconnection phase and the final storm water system phase. For Level of Service for protection against basement backups, use Water-in-Basement (WIB) Program requirements in the Consent Decree and associated exhibits (now called the Sewer Backup (SBU) Program), and applicable decisions of the Magistrate or Judge in reviewing WIB claims.

5. There are two primary issues associated with peak flows: (i) impacts to overland flooding and (ii) in-stream flooding/hydromodification. To address these issues, use current Hamilton County requirements (e.g., Ohio EPA MS4 NPDES Permit; County Engineer's Rules) or MSD Rules and Regulations, in addition to the following:

   (a) Calibrated and validated collection system models that model the proposed storm sewer system to understand flow routing and overland flooding impacts. "Code of Practice for the Hydraulic Modeling of Sewer Systems" — Wastewater Planning Users Group (WaPUG) Version 3.01 (2002), and MSDGC Modeling Guidelines and Standards November 2011, shall be used.

   (b) Calibrated and validated in-stream flow models that model the proposed storm sewer discharges and their effects on in-stream flooding/hydromodification. Models in items (a) and (b) shall be connected where needed to assess Separation project impacts. Models based on Industry Standards to be developed by MSD and approved by the County Administration.

   (c) Separation projects shall be designed to evaluate and address overland flooding risks. If the new storm water conveyance system capacity is exceeded due to a storm event that is more severe than the design storm, the expected path of overland flooding shall be determined and potential impacts to private and public property identified. A mitigation plan shall be developed both during any temporary reconnection phase and the final storm water system phase to address the overland flooding and mitigate identified potential impacts. The standards governing when such mitigation is required shall be developed by MSD and approved by the County Administration. Detention of peak flows as a mitigation method shall be evaluated.

   (d) Separation projects shall be designed to not increase in-stream flooding and/or hydromodification (increase in in-stream shear stress/sediment transport), except with BOCCs approval after evaluation of risks. Post-Separation peak flow discharges into streams shall be evaluated to determine if they will increase in-stream flooding and/or hydromodification. If in-stream flooding/ hydromodification is excessive in current conditions or the Separation project will increase in-stream flooding/hydromodification, project shall be designed to detain the peak flows to 50% or less of the 2-year storm in predevelopment forested conditions to improve/reduce in-stream flooding/ hydromodification. Other appropriate equivalent means to address the flooding/hydromodification conditions may be proposed.

Attachment H

Technical Criteria for Projects that Separate Storm Water from the Combined Sewer System and Reconnects to the Combined Sewer System

1. Applies to projects that separate storm water from the combined sewer system to infiltrate or detain storm water flows before reconnecting to the combined sewer system, and/or at a later date be separated from the combined sewer system. These requirements also apply to Separation projects with a phased implementation which will result in the later creation of new MS4 discharges.

2. These projects will be evaluated under this Storm water Separation Policy by analyzing;

   (a) Cost per gallon of CSO reduced, evaluating the lowest cost solution for CSO reduction.

   (b) Identify the Water Quality benefit provided by the BMP's to be implemented.

   (c) Design in accordance with **Attachment C** "Technical Water Quality Evaluation Criteria to Meet Current Legal Standards" to remove the pollutants of concern to the designated levels for the most likely stream receiving the separated storm water discharges.

   (d) Design in accordance with **Attachment D** "Technical and Water Quality Evaluation Criteria to Meet Future Legal Standards" to remove the pollutants of concern to the designated levels for the most likely stream receiving the separated storm water discharges.

   (e) Design to meet the technical requirements set forth in **Attachment F** "Sewer Separation Project Water Quantity/Flooding Decision Flow Chart".

Attachment I

Storm Water Separation Policy Guidance: Sample Scope of Work

The following Sample Scope of Work is guidance for implementing the Storm Water Separation Policy.

Sample Scope of Work

Follow *Attachment A –Sewer Separation Project Decision Flow Chart for Water Quality* of the Separation Policy. Confirm if project has been "*selected to achieve the lowest cost for the amount of in-stream water quality standards compliance*" as stated in the second decision box of the flowchart. If the answer is "Yes", proceed to the analysis described below. If the answer is "No" or "Not Sure" follow the remaining steps in the Attachment A Decision Flow Chart.

Four Main Areas of Analysis:

1. Water Quality Compliance Impact
2. Water Quantity/Flooding
3. Costs – Short-term & Long-term
4. Ownership of Old & New Pipes – Storm water Only & Sanitary Sewage Only Scenarios

All steps outlined below shall be completed for each project. **For storm water projects that discharge into waterways with a tributary area less than 600 acres, the analysis can be based partially upon water quality data and stream flow data from larger watersheds in which these sub-basins under study are located.**

REPORT

Document the analysis of all four areas with a comprehensive report which includes the water quality and flow conditions relevant to the specified storm condition, including backup data, model documentation and calculations, the associated costs, and ownership assessment & recommendation.

Area 1: Water Quality Compliance Impact

Outcome:

1. Identifying the number and locations of required Best Management Practices (BMPs) needed for the project to remove the pollutants of concern for the waterbody such that they Do Not Cause or Contribute to WQS exceedances or exceed target in-stream values.
2. Identifying the pollutants of concern that cannot be sufficiently reduced with BMPs. Identify the other technologies that may be required to reduce these pollutants to the required loadings.

Steps to Follow to Implement the Policy:

1. Collect local representative Water Quality (WQ) sample data on storm sewer discharges, and in-stream water quality.

    a. WQ data for storm sewer discharges will be used to set the baseline pollutant concentrations typically occurring in storm water. Locally collected data should be compared against available literature data to understand local differences.
        i. See Attachment C of Policy for Bacteria, nitrate+nitrite, total P,
        ii. See Attachment D of Policy for TSS, Organics, Metals, Toxics, Temp, D.O.
    b. WQ data for in-stream will be used for updating/developing in-stream WQ models

2. Collect local representative effluent WQ data from green infrastructure BMPs that would be used to treat the Storm water (SW) to remove the pollutants of concern. Locally collected data should be compared against available literature data to understand local differences.

3. Develop a calibrated and validated in-stream WQ model for the particular waterway that the project will discharge to:

    a. For small projects and projects that discharge into small waterways of 600 acres or less of tributary area, WQ models are not necessary. Pollutant loading calculations compared to pollutant in-stream Water Quality Standards (WQS) or in-stream target concentration can be used instead.
    b. For larger projects that discharge to the Mill Creek or waterways of more than 600 acres of tributary area, the existing WQ models can be used or new WQ models developed (as needed).

4. Confirm collection system hydraulic model is calibrated and validated to MSD modeling standards. Update hydraulic model as necessary to meet MSD standards.

5. Using knowledge about the receiving water body, determine the WQS or target in-stream concentration (when a WQS has not yet been set) for the pollutants of concern as listed in Step 1.a.i and 1.a.ii.

    a. Example: Bacteria WQS is 126 cfu/100 ml for E.Coli, Target concentration for Nitrate+Nitrite = 2.5 mg/l, Total P = 0.25 mg/l (Mill Creek TMDL target values – Attachment C)

6. Compare SW baseline pollutant concentrations (from Step 1a) against the WQS and target in-stream concentrations for the pollutants of concern (from Step 5).

a. If SW baseline pollutant concentrations do not exceed WQS or target in-stream concentration – no further work is needed for that pollutant(s).
b. For SW baseline concentrations that exceed the in-stream WQS or target value proceed to next step.

7. Determine pollutant load reduction required so SW discharges Do not Cause or Contribute to in-stream WQS exceedances or in-stream target concentration for each pollutant of concern.[1]

   a. Small projects (as defined in Step 3a) – Utilize simple mixing calculations to analyze required pollutant discharge loading such that the in-stream target value or in-stream WQS is met. Flows from the storm water separation project shall be based on both current separated flows as well as future flows if the project is part of a larger overall separation of the sewershed. Assume a baseline flow and baseline pollutant concentration (for each pollutant of concern) in the waterway to be used in the mixing calculations. Select and Design BMPs to meet the required pollutant discharge loading for each pollutant of concern.

      For example, separation projects less than 600 acre tributary area,

      i. Add green infrastructure BMPs along roadways, other utility easements or at the SW discharge such that E. coli with the SW discharge meets the in-stream WQS or target value after in-stream mixing.
      ii. Determine which pollutants of concern are not reduced to the in-stream WQS or in-stream target values by a specific BMP. For example, utilizing BMPs will not sufficiently reduce the pollutant concentration for Copper to the in-stream target value or in-stream WQS. List the pollutants of concern that can't be sufficiently addressed through BMPs.

   b. Projects greater than 600 acres (as defined in Step 3b) – Utilize calibrated and validated WQ model. Flows from the storm water separation project shall be based on both current separated flows as well as future flows if the project is part of a larger overall separation of the sewershed. Analyze WQ with and without background sources for typical year to determine required pollutant load reduction in order to not cause or contribute to in-stream target value or in-stream WQS exceedances. Required load reduction is established at the pollutant load from which no increase in attainment of in-stream WQS or decrease in target pollutant concentration is achieved.

[1] Proposed new single property development or redevelopment of areas tributary to proposed storm water separation projects should undergo a separate analysis under applicable County and local jurisdictional standard.

i. Based on the identified pollutant load reduction, select and design BMPs to achieve the identified load reduction.

ii. Determine which pollutants of concern that utilizing BMPs to reduce the pollutants to the in-stream WQS or in-stream target values is not possible. For example, utilizing BMPs will not sufficiently reduce the pollutant concentration for Copper to the in-stream target value or in-stream WQS. List the pollutants of concern that can't be sufficiently addressed through BMPs.

8. For the pollutants of concern that can't be sufficiently addressed through BMPs (identified in Step 7.a.ii and 7.b.ii), determine if other technologies can be used to reduce those pollutants to the in-stream WQS or in-stream target values before discharge. Determine costs associated with utilizing the other technologies. Costs will be used under Area 3 – long-term costs.

Area 2: Water Quantity/Flooding

Outcome:

1. Identify impacts to overland flooding from the proposed storm water separation project when capacity is exceeded. Prepare a Mitigation Plan for the impacts.
2. Identify if there an increase or decrease in basement backups from the project. Mitigation plan to eliminate any increase acceptable to County.
3. Identify impacts to in-stream flooding and hydromodification from the project. Prepare a Mitigation Plan to address the impacts.

Steps to Follow to Implement the Policy:

1. Add the project storm sewers to the collection system hydraulic model to understand impact on remaining combined sewer system and new storm sewer system. Collection system hydraulic model contains the ability to model overland impacts and where the stormwater will travel.

2. Thoroughly and accurately identify, evaluate and document the following with regard to the level of service (storm year/size capacity) (collectively, "Level of Service"):

   (a) The existing Level of Service in the specific areas to be impacted by the Separation project;

   (b) The Level of Service that would be required or used if the local jurisdiction constructed and paid 100% of the Separation project;

   (c) The Level of Service that would be used if the Separation project is designed according to the standards of the Hamilton County Engineer;

(d) If the Separation project is within the City of Cincinnati, the Level of Service under the City's Storm Water Management Utility ("SMU") standards;

(e) The MSD recommended Level of Service to be provided by the Separation project after construction with justification, including justification for any deviations from existing Level of Service; and

(f) If the MSD recommended Level of Service is different from the local jurisdiction's or Hamilton County's required Level of Service based on their required rainfall distribution, then provide the cost differential between MSD's recommended Separation project costs and an alternative project using, (i) existing Level of Service, (ii) 10 year storm Level of Service, (iii) 25 year storm Level of Service, (iv) 50 year storm Level of Service, and (v) 100 year storm Level of Service. Storms shall be based on the SCS Type II storm rainfall distribution.

3. Run hydraulic model for storm events larger than the new storm sewer design capacity, i.e., storm events greater than the 25-year storm in most cases. Run model for both temporary reconnection phase and the final storm water system installation phase.
    a. Assess where storm water flows overland in the model when storm sewer capacity is exceeded. Document flow paths.
    b. Understand where basement backups decrease and if an increase in backups may occur downstream where storm sewers reconnect to existing combined sewers. Document results.
4. Based on results of Step 2, develop a mitigation plan to address:
    a. Any overland flooding impacts
    b. Increases or changes in basement backups
5. In-Stream Flooding/Hydromodification Evaluation – Develop calibrated and validated in-stream flow model to model impacts:
    a. Small projects that discharge into small creeks or tributaries – In-stream flow model not necessary. In-stream field walks can be made to assess existing flooding and erosion impacts in the stream.
    b. Larger projects that discharge into Mill Creek, Muddy Creek, etc. use existing in-stream flow models or develop new in-stream flow model. Model developed for water quality analysis in Area 1 WQ Impacts can be used for this analysis.
    c. Projects that discharge to the Ohio River directly would not need a in-stream flooding/hydromodification evaluation due to the overall size of the Ohio River.
6. Determine flooding and hydromodification impacts from proposed stormwater separation project:
    a. Small projects – If field walks show waterway has excessive existing hydromodification then design project to detain peak discharge flows to 50% or

less of the predevelopment flow for a 2-year storm. Other appropriate equivalent means to address the flooding/hydromodification conditions may be proposed.

b. Larger projects – Run in-stream flow models for storm events ranging from the 2-year to 100-year storm events with and without the flows from the stormwater separation project and determine changes in in-stream velocities and flooding levels.
    i. If the in-stream model shows excessive flooding and/or hydromodification in existing conditions then you know that the added storm water from the project will exacerbate this existing condition.
    ii. Design project to detain peak discharge flows to 50% or less of the predevelopment flow for a 2-year storm. Other appropriate equivalent means to address the flooding/hydromodification conditions may be proposed.
    iii. If the in-stream model does NOT show excessive flooding and/or hydromodification in existing conditions and the additional SW from the project will not cause the existing condition to increase or worsen then no detention is required for the project. This will be a very rare case as most urban streams have excessive flooding and hydromodification.

Area 3: Costs – Short-term & Long-term

Outcome:

1. Determine Minimum Cost - Capital and life-cycle costs for complying with minimum WQ requirements (addressing Bacteria and Nutrients) set forth in the Policy, Attachment C.

    a. Specifically, the costs to install and maintain the required BMPs identified in Area 1 WQ Compliance Impact (above) will be provided in addition to the base cost of the project needed for the project to remove the pollutants of concern for the water body such that they Do Not Cause or Contribute to in-stream WQS exceedances or exceed target in-stream values.

2. Determine Best Value Cost- Capital and life-cycle costs to add to Minimum Cost to control the additional pollutants of concern to a reasonable level as listed in the Policy, Attachment D, without a significant increase in cost.

3. Determine Maximum Cost – Capital and life-cycle costs required to meet all of the pollutants of concern listed in the Policy, Attachment D.

Steps to Follow to Implement the Policy:

1. Minimum Cost – Estimate costs for the BMPs identified and designed in Step 7a and 7b in Area 1 WQ Compliance Impact to address the Policy Attachment C pollutants (Bacteria and Nutrients). Determine total capital cost, operation and maintenance costs, and life-cycle cost over 25 years and 40 years.

2. Best Value Cost – Estimate the additional cost of BMPs identified in Steps 7a and 7b in Area 1 WQ Compliance Impact to address the Policy Attachment D pollutants (TSS, Organics, Metals, Toxics, Temperature, Dissolved Oxygen). Determine which BMPs are low cost and can be added to the Minimum Cost in order to not significantly increase the Minimum Cost. Determine total capital cost, operation and maintenance costs, and life-cycle cost over 25 years and 40 years for these best value BMPs.

3. Maximum Cost – Determine cost to address all of the Policy Attachment D pollutants identified in Steps 7a and 7b of Area 1, including the costs identified in Step 8 of Area 1 that require alternative technologies to address the pollutants. Determine total capital cost, operation and maintenance costs, and life-cycle cost over 25 years and 40 years.

Area 4 - Ownership of Old & New Pipes – Storm water Only & Sanitary Sewage Only Scenarios

Outcome:

1. Total capital, operation and maintenance, and life-cycle costs and associated project risks for a new storm water pipe system for storm water separation. In this case, the existing combined sewer would be used as a sanitary sewage system.
2. Total capital, operation and maintenance, and life-cycle costs and associated project risks for a new sanitary sewage system for storm water separation. In this case, the existing combined sewer would be used as a storm sewer system.

Steps to Follow to Execute the Policy:

1. Determine scope of proposed storm water separation project.
    a. Analyze the feasibility and routing for a new storm sewer system to perform the separation. The existing combined sewer would be used as a sanitary sewage system in this case.
    b. Analyze the feasibility and routing for a new sanitary sewer to perform the separation. The existing combined sewer would be used as a storm sewer system in this case.
2. Determine associated project risks for Steps 1a. and 1b above.
3. Determine total capital, operation and maintenance, and life-cycle costs for Steps 1a. and 1b above.
4. Provide a recommendation regarding future ownership of new and existing storm water pipes and rationale for recommendation.